

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
1 August 2002 (01.08.2002)

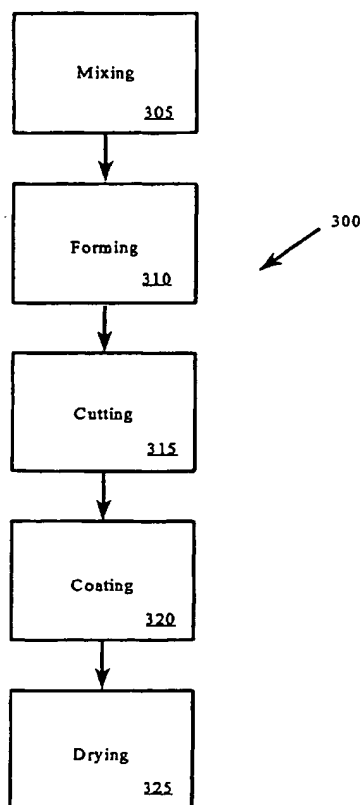
PCT

(10) International Publication Number
WO 02/058902 A2

- (51) International Patent Classification⁷: **B28B**
- (21) International Application Number: PCT/US02/02106
- (22) International Filing Date: 25 January 2002 (25.01.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/264,068 26 January 2001 (26.01.2001) US
- (71) Applicant (for all designated States except US): **LA-FARGE NORTH AMERICA INC.** [US/US]; 12950 Worldgate Drive, Herndon, VA 20170 (US).
- (72) Inventor; and
(75) Inventor/Applicant (for US only): **COLBERT, Elizabeth, A.** [US/US]; 1461 Oxbow Drive, Blacklick, OH 43004 (US).
- (74) Agents: **ROWLAND, William, C. et al.; BURNS, DOANE, SWECKER & MATHIS, LLP**, P.O. Box 1404, Alexandria, VA 22313-1404 (US).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),

[Continued on next page]

(54) Title: **COATED GYPSUM BOARD PRODUCTS AND METHOD OF MANUFACTURE**



(57) Abstract: A gypsum board is coated with a coating during the manufacturing process to form a coated gypsum board. Coatings are applied to wet gypsum boards before being dried in the oven and coating penetrates through at least a portion of the facing sheet and into the gypsum core of the gypsum board. Board strength and, where applicable, paper adhesion are improved by application of a coating. Rapid coating compositions allow faster installation; quick setting compositions provide for more durable finishes. Either coating may be made lightweight by addition of perlite and may have enhanced finish appearance by incorporating pigments. A coated gypsum board can be fastened to a support structure to form a wall and the seams between adjacent coated gypsum boards can be taped and finished using a joint compound having a composition substantially similar to the composition of the coating. Overall, the resulting coated gypsum board and the method used to produce it help to improve final finish appearance and to reduce manufacturing time and costs.



WO 02/058902 A2



Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR,
GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR,
NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

- *without international search report and to be republished upon receipt of that report*

-1-

COATED GYPSUM BOARD PRODUCTS AND METHOD OF MANUFACTURE

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION:

[0001] The present invention relates generally to coatings for gypsum board products, and the production thereof. More particularly, the present invention relates to the composition of coatings for gypsum board products, and methods of producing and applying the coatings in one continuous gypsum board manufacturing process.

DISCUSSION OF RELATED ARTS:

[0002] In the discussion of the related art that follows, reference is made to certain structures and/or methods. However, the following references should not be construed as an admission that these structures and/or methods constitute prior art. Applicant expressly reserves the right to demonstrate that such structures and/or methods do not qualify as prior art against the present invention, if appropriate.

[0003] The product density and surface type and finish of traditional gypsum board products are manufactured to have a desired strength and appearance while minimizing product weight and costs. Generally, calcined gypsum slurry is agitated in a mixer with aqueous foaming agents and deposited onto a conveyor carrying a facing sheet. A backing sheet is applied over the slurry and the wet gypsum board product is formed to the desired thickness between forming rollers. The wet gypsum sets during the conveying process, is cut to the desired length, and is dried by passing the gypsum board product through a drying oven.

[0004] Coatings for gypsum board products may be used to impart surface homogeneity and improved surface appearance, both in the manufactured condition and after a decorative coating has been applied. An example of a

-2-

previously known two-step manufacturing method for coated gypsum board products is disclosed in Australian Patent Application No. 19322/92, the disclosure of which is incorporated herein by reference. A surface coating is applied to the facing sheet and dried before the gypsum is applied to the facing sheet in the gypsum board manufacturing process.

[0005] An alternative method for applying a coating utilizes a separate coating process subsequent to the manufacture and drying of the gypsum board product.

[0006] U.S. Patent No. 6,105,325, issued to Zuber et al., the disclosure of which is also incorporated herein by reference, discloses the use of matching the finished appearance of a joint-pointing coat to that of the lining of the paper of the plaster boards jointed.

[0007] In the above processes, the coating imparts desirable aesthetic qualities including surface coloration, reflectance, and absorbency. However, the methods are capital intensive, requiring separate and dedicated production facilities in which to apply the coating and suffering inefficiencies by not being part of a larger in-line production facility.

SUMMARY

[0008] The present invention provides a coated gypsum board which can be produced in one continuous gypsum board manufacturing process. Such gypsum board can be made either with paper on both sides thereof, paper on one side thereof, or without paper on either side thereof. Further, such gypsum board coatings may be applied to wet gypsum board prior to drying.

[0009] In an exemplary embodiment, a coated gypsum board comprises a gypsum core having a first side and second side and a facing sheet disposed on the first side. A coating is disposed on at least a portion of the facing sheet and at least a portion of the coating penetrates into the gypsum core. In an additional embodiment, the gypsum board further comprises a backing sheet on the second side of the gypsum core. In one aspect, the coating may penetrate into the gypsum

-3-

core to a substantially uniform depth across an area of the gypsum board. A gypsum board with such a coating exhibits a nail hold value of greater than 80 pounds.

[0010] In a method of producing a coated gypsum board, a gypsum slurry is deposited to form a wet gypsum board, a coating is applied to the wet gypsum board, and the wet gypsum board is dried. The coating can be applied directly to the gypsum core or to a facing sheet applied over the gypsum slurry. When the coating is applied to the gypsum board prior to drying, the coating can penetrate into the facing sheet and/or the gypsum core and forms a coating that is up to 30 mils in thickness.

[0011] In one exemplary embodiment, a coating to be applied to a gypsum board is a joint compound or a diluted joint compound.

[0012] In another exemplary embodiment, the coating has a composition of 25-75 vol. % water, 30-70 wt. % calcium carbonate, 0-30 wt. % fillers, 2-10 wt. % latex emulsion, and 0-10 wt. % other additives. Fillers can comprise one or more of mica, talc, clay and limestone. 2-8 wt. % perlite can be added to the coating to form a lightweight product and pigment can also be added in an amount effective to provide a desired tint to the coating.

[0013] In a further embodiment, a coating to be applied to a gypsum board has a composition of 10-60 vol. % water, 50-90 vol. % calcined gypsum; 0.1-10 vol. % binder; 0-50 vol. % limestone; 0-10 vol. % clay; 0-30 vol. % other fillers; and 0-10 vol % additives. Fillers can comprise one or more of mica and talc. 2-15 vol. % perlite can be added to the coating to form a lightweight product and pigment can also be added in an amount effective to provide a desired tint to the coating.

[0014] An exemplary method of making a wall deposits a gypsum slurry to form a wet gypsum board having a gypsum core, applies a coating to the wet gypsum board, and dries the wet gypsum board. The step of applying the coating occurs prior to the step of drying the wet gypsum board. The coated gypsum board is then fastened to a support structure to form the wall and the seams between

-4-

adjacent coated gypsum boards are taped and finished using a joint compound having a composition substantially similar to the composition of the coating.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0015] Aspects and advantages of the invention will become apparent from the following detailed description of preferred embodiments thereof in connection with the accompanying drawings in which like numerals designate like elements and in which:

[0016] Figure 1 is a cross-sectional view of a coated gypsum board with a coating applied to a facing sheet.

[0017] Figure 2 is a cross-sectional view of a coated gypsum board with a coating applied to the gypsum core.

[0018] Figure 3 is a schematic of an embodiment of a production line incorporating a coating step prior to drying a gypsum board.

[0019] Figure 4 is a schematic plan view of the coating step showing a coating machine.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] Although the description herein may from time to time refers to either a wallboard, a ceiling tile, a ceiling board, or collectively to a gypsum board, in each case, the concepts of the present invention may be applied generally to wallboards, ceiling boards, or ceiling tiles.

[0021] Generally, gypsum board is installed during construction on surfaces such as wall, ceilings, and the like, in edge abutting engagement. After affixing the gypsum board to the surface with suitable attachments (e.g., nails, screws, epoxy, and so forth), the seams and/or artifacts from the attachments (e.g., depressions from nails, nail heads, screw holes, and so forth) are covered with a coating to present a uniform and smooth finish. For seams, said coatings can be used in

-5-

combination with tape. The coating material is sometimes referred to as joint compound.

[0022] Coatings for use in the gypsum board industry can be of one of two types. In a first type, the coating is applied and the evaporation of water over time produces a hard coating. In a second type, the coating is applied and allowed to set for a suitable time during which the components of the coating solidify into a hard gypsum-based coating.

[0023] A coating of either of the first type or the second type can be applied to one side of a gypsum board (e.g., applied to a facing sheet or directly to a gypsum core) during the manufacturing process to form a coated gypsum board. The selection of the coating can be made such that the coating of the coated gypsum board substantially matches the coating or joint compound intended to be used to cover the seams and/or artifacts of attachment associated with the affixing of the coated gypsum board to a structural support.

[0024] An embodiment of a coated gypsum board 100 is shown in Figure 1. A gypsum core 105 is disposed between a backing sheet 110 and a facing sheet 115. A coating 120 is disposed on the facing sheet 115. An alternative embodiment of a coated gypsum board 200 is shown in Figure 2, in which a coating 205 is directly disposed on a gypsum board 210. It should be clear that any combination of facing sheet and backing sheet may be utilized in practicing the invention. In cases where one or more sheets have been removed, the coating may be applied directly to the gypsum core with attendant penetration of the coating into the gypsum core.

[0025] The coating is evenly applied onto the surface of the gypsum board (e.g., applied to the facing sheet, if used, or directly to the gypsum core) to a uniform thickness t that is preferably not sensitive to surface irregularities. A typical thickness t for the coating is up to 30 mils, preferably from 3-20 mils, and more preferably from 5-15 mils. The preferred thickness can be dependent on the ultimate application. For example, for wallboards, the thickness t is preferably 10

-6-

mils; for ceiling tiles it is 20 mils. Furthermore, thicknesses outside of these ranges may also be contemplated by the present invention. However, a coating of approximately 30 mils or greater may result in cracks and grazing of the surface finish when dried. Accordingly, thicker coatings should be used carefully.

[0026] In embodiments in which the gypsum board has a facing sheet, the coating may penetrate into at least a portion of the facing sheet and, in some cases, all the way through the facing sheet and into sections of the gypsum core, over at least a portion of the gypsum board. In one embodiment, the coating may penetrate into the gypsum board over substantially the whole of the area to which it is applied, i.e., the whole gypsum board, or predetermined portions if selected regions of the gypsum board have been coated.

[0027] The depth of penetration of the coating can be influenced by the relative moisture level and/or degree of set of the gypsum board, although the coating preferably penetrates into the gypsum board to a substantially uniform depth. In the cross-sectional view as shown in Figure 1, the coating 120 is shown to have penetrated into the facing sheet 115 and into the gypsum core 110 to a depth d . In other cases, i.e., where the moisture content is lower or the gypsum is in a state of more advanced set, the coating only penetrates a certain depth into the facing sheet. In one embodiment of a gypsum board with a facing sheet, the depth of penetration into the gypsum core is from about 5 mils to 20 mils, preferably from 10 mils to 15 mils. In embodiments of a gypsum board without a facing sheet, the depth of penetration is from about 5 mils to 30 mils, preferably from 10 mils to 20 mils.

[0028] A method of producing a coated gypsum board is shown in Figure 3, in which a flow chart of a coated gypsum board manufacturing line is depicted. The general manufacturing steps 300 include mixing 305 the gypsum slurry and forming 310 the gypsum into a desired shape, cutting 315 the gypsum into the desired dimensions, followed by coating 320 to form a gypsum board product and then drying 325. Setting of the gypsum occurs primarily between the forming step

-7-

310 and the cutting step 315. The manufacturing steps from forming 310 to cutting, inclusive, are herein described as the forming and setting line; the steps following cutting 315 are herein described as the coating and drying line.

[0029] Starting at the forming and setting line, a formed, coated gypsum board is manufactured. In a first embodiment, a gypsum core is coated on a first surface with a coating while the gypsum core is wet. In alternative embodiments, the gypsum board has a facing sheet and/or a backing sheet and is coated on a first surface, e.g., on the facing sheet surface, with a coating while the gypsum core is wet. For purposes of this application, a gypsum core is considered wet at any time during the manufacturing process before the gypsum board is passed through the drying oven.

[0030] To control the setting time of the gypsum core, the components of the gypsum board can be adjusted, by, for example, controlling the quantity of accelerator and the retarder used in the composition of the gypsum slurry. The accelerator includes small crystal-like objects which are coated with a starch or other dissolvable substances. As the coating on the starch or other dissolvable substances is dissolved, the accelerator crystals form a starting point or seed for crystal growth of the gypsum. Retarder is preferably added to the gypsum board components in order to delay the set time of the gypsum core. The retarder has no long term effect on the strength or other characteristics of the final board product.

[0031] It is desirable to delay the set time under certain circumstances so that the gypsum slurry does not set earlier than desired. For example, if the gypsum slurry begins to set in the mixer, inefficiencies result, such as blocked and/or clogged apparatus with attendant down time for maintenance and/or repairs. In addition, if the slurry sets beyond the mixer but prior to forming, forming of the slurry may cause the crystal structure to be disrupted during the setting process, which can result in a weaker final board product. Accordingly, accelerator and retarder may be used singularly or in combination to adjust the set time of the

-8-

gypsum to achieve a desired set or hardness at a desired time in the manufacturing process.

[0032] After forming, the gypsum board is conveyed by a conveying system along the forming and setting line to a cutting position. The conveying speed and distance are chosen in combination with the set time of the gypsum to result in gypsum having a desired set or hardness for subsequent cutting and manipulation. Cutting is accomplished by a cutting machine, as is conventionally known in the art. After being cut, the gypsum board is turned over and placed on a conveying surface and transported to a coating and drying line. Where the gypsum core has a facing and/or backing sheet, the manipulation of the gypsum board results in placing the backing sheet in contact with conveying surface and exposing the facing sheet.

[0033] On the coating and drying line, the gypsum board, with or without the facing and/or backing sheet, is conveyed by the conveying means through coating machinery, which is located prior to the drying apparatus. Figure 4 schematically depicts an in-line coating process 400. The coating machinery 405 is positioned over the conveying path 410 of the gypsum board 415. The conveying path typically includes a conveying belt 420 on which the gypsum board to be coated has been placed, although other suitable conveying paths can be used, such as driven and nondriven rollers. An uncoated and wet gypsum board 425 is passed under the coating machinery 405 and a coating is applied via a coating applicator 430. The coated gypsum board 435 is then conveyed to the next manufacturing steps, if any, and is then dried in, for example, an oven.

[0034] The coating can be applied using traditional coating machinery, such as a curtain coater. An example of a curtain coater is that provided by Hymmen International, which can be custom designed to adapt to a particular production line or manufacturing facility. The curtain coater provides a continuous curtain of the coating through which the wet gypsum board is passed. Alternative coating machinery may include sprayers, such as nozzle or shower sprayers, drip lines,

-9-

and atomization techniques. An example of a spray technology is that provided by Graco, Inc. using spray tips suspended over the wallboard line. Another alternative method is a blade technology that scrapes the coating mix on to the surface of the gypsum board, i.e., on the surface of the gypsum core or the facing sheet.

[0035] Coatings may be applied to the gypsum board under any condition of set of the gypsum. For example, the coating can be applied before oven drying, thus allowing the coating to penetrate into the wet facing sheet and/or the wet gypsum core during the conveying period. After coating, the coated gypsum board is dried and then prepared for storage and shipping. Alternatively, the coating can be applied after drying where, for example, the coating is heat sensitive or penetration into the facing sheet is to be minimized.

[0036] Coatings can be applied to the whole surface area of the gypsum board, or to predetermined portions thereof. In the latter, predetermined portions can be so designated by, for example, masking the gypsum board to prevent coating of the designated sections or by adjusting the coating machinery to only apply a coating to predetermined portions.

[0037] Several alternative embodiments of compositions of coating are envisioned, each affecting the end product. One embodiment of a coating, referred to herein as the "rapid coating", is a coating that hardens by evaporation of the water content. The rapid coating comprises water; calcium carbonate; fillers such as limestone, mica, talc, and/or clay; binder; latex emulsion; and other additives such as preservative, and thickener. The rapid coating is provided with a water content of 35-45 wt. % and is diluted in the mixture to between 10% and 60% dilution, e.g., to between 25-70 wt. %, preferably between 39 wt. % and 56 wt. % water, by the addition of water. Table 1 presents an exemplary formulation of an embodiment of the rapid coating.

[0038] Table 1

Component	Amount (wt. %)
water	25-75
calcium carbonate	30-70
mica	0-10
talc	0-10
clay	0-10
latex emulsion	2-10
other additives	0-10

[0039] In a lightweight embodiment of the rapid coating, the filler can include from 2% to 8% by weight perlite. An additional embodiment of the rapid coating incorporates a pigment added in an amount effective to provide a desired tint to the coating. Additionally, the rapid coating may be made so as to substantially match a property of the joint compound, such as the absorbency, the reflectance, and so forth. The substantial matching of one or more properties may improve the aesthetic appearance of the gypsum board in the finished condition after a decorative coating has been applied.

[0040] Thus, according to one aspect of the invention, a wall can be assembled by producing a gypsum board and coating the gypsum board before the drying step with a joint compound or a diluted joint compound. And, when the gypsum board is fastened to a supporting structure to form the wall, the seams between adjacent boards can be taped and finished using a joint compound having a substantially similar composition to the coating.

[0041] Another embodiment of the present invention uses a coating referred to hereinafter as the "setting coating". The setting coating forms a hard gypsum-based coating by a setting process similar to that of the gypsum in the gypsum board. The setting coating comprises is a dry product comprising calcined gypsum; binder; fillers such as limestone, mica, talc, and/or clay; and other additives such as preservative, accelerator, and thickener. The calcined gypsum may be either alpha or beta type or a blend of these types. Prior to use the setting

-11-

coating is mixed with 30-60 vol. % water to form a mixture. Table 2 presents an exemplary formulation of a setting coating.

[0042] Table 2

Component	Amount (vol. %)
Water	10-60
Calcined gypsum	50-90
Binder	0.1-10
Limestone	0-50
clay	0-10
Other fillers	0-30
Other additives	0-10

[0043] In a lightweight embodiment of the setting coating, the filler can include from 2% to 15% by volume perlite. An additional embodiment of the setting coating incorporates a pigment added in an amount effective to provide a desired tint to the coating.

[0044] The setting coating is generally more resilient to impact, i.e., tougher, than the rapid coating, and may be utilized to provide an abuse resistant surface on the gypsum board, for example, for use in high traffic areas or public spaces. Additionally, the rapid coating may be made so as to substantially match a property of the joint compound, such as the absorbency, the reflectance, and so forth. The substantial matching of one or more properties may improve the aesthetic appearance of the gypsum board in the finished condition after a decorative coating has been applied.

[0045] Binders suitable for use in the above rapid coating and setting coating include starches, which assist the binding properties. Examples of such binders are wheat starch which can be preset between 0.01 and 5%.

[0046] A preservative suitable for use in the above rapid coating and setting coating can be present between 0.01 and 5%. This additive prevents the product from spoiling prematurely, prior to application. The coatings can spoil because

-12-

there can exist inside the formulations water and/or a number of organic raw materials. The preservative is also commonly known as the biocide.

[0047] Accelerators may be used to adjust the set time in the above setting coating. An example of an accelerator is potassium sulfate. The accelerator can be present in a suitable amount to achieve the desired set time. Typically, the accelerator is present from 0.01 and 15% by solids weight.

[0048] Thickeners, such as generic cellulose-based thickeners, may be used to adjust the rheological properties of the coatings and can be present in suitable amounts. Typical values are between 0.01 and 35% by solids weight.

[0049] The penetration of the coating provided by the application of coatings to a wet gypsum board results in improved coated gypsum board properties, such as better adhesion of the facing sheet to the gypsum core. In one example, a coating improves board strength, as measured by nail hold. Table 3 includes nail hold values for both coated gypsum board and uncoated gypsum board. From Table 3, it is shown that the coating improves nail hold by up to 25% of nail hold values for traditional uncoated gypsum board products.

[0050] Table 3

sample	nail hold value
coated	80 pounds
uncoated	63 pounds

[0051] Additionally, a coated gypsum board displays a mechanical or strength advantage over uncoated gypsum board products that may allow for utilization of facing sheets of lower weight with attendant cost reductions. Typically, facing sheets are anywhere between 40 to 60 lbs. weight. In some applications, the facing sheet is a paper blended with mineral or synthetic fibers. If the facing sheet is to be coated, the improved board strength imparted by the coating allows the paper weight to be reduced. This advantage of the invention is realized while still obtaining the required handling characteristics to allow manipulation without breakage during the manufacturing process.

-13-

[0052] According to one preferred embodiment, a gypsum board is produced by forming a gypsum slurry and depositing the slurry onto a facing sheet laid out on an endless conveyor belt. A backing sheet is then laid on top of the gypsum slurry. The facing sheet, the gypsum slurry, and the backing sheet are then formed into a wet gypsum board by passing the gypsum and optional facing and backing sheet through a forming roller or rollers to produce the desired thickness. The wet gypsum board is carried by a conveyor belt until a set time expires, after which the gypsum board is cut into desired lengths with a blade cutter, and then passed through a mechanical coater. A subsequent application of heat, such as in a dryer or an oven, removes excess water. At any stage during the process, either the facing sheet or the backing sheet or both may be removed.

[0053] In an alternative embodiment of the present invention, the gypsum board product can be formed in a manufacturing line as generally known for making ceiling tiles. In such a process, the desired components are blended with a high shear mixer in a batch. The batch is then extruded through an opening of an extruder onto an endless conveyor belt. After a predetermined set time, the mixture is then cut into desired lengths. The cut lengths are then passed through a mechanical coater followed by a dryer to evaporate the excess water.

[0054] According to an embodiment of the present invention, lightweight gypsum boards can be made. The density of such boards can range from as low as 1,000 lbs. per thousand square feet to about 1,700 lbs. per thousand square feet, or greater. After cutting the gypsum and while the gypsum is still not dry, the wet gypsum board is transported to the coating and drying line. A coating of thickness of up to 30 mils is applied which is subsequently dried in a drying process, e.g., dried in an oven.

[0055] According to another embodiment of the present invention, a gypsum board product of a desired thickness can be made as conventionally known. For example, a 1/2 inch or 1/4 inch gypsum board can be made. After cutting the gypsum and while the board is still not dry, the wet gypsum board is transported

-14-

to the coating and drying line. A coating of thickness of up to 30 mils is applied which is subsequently dried in a drying process, e.g., dried in an oven.

[0056] Although the present invention has been described in connection with preferred embodiments thereof, it will be appreciated by those skilled in the art that additions, deletions, modifications, and substitutions not specifically described may be made without department from the spirit and scope of the invention as defined in the appended claims.

-15-

WHAT IS CLAIMED IS:

1. A gypsum board having a coating applied thereon, the gypsum board comprising:
 - a gypsum core having a first side and a second side and a facing sheet disposed on the first side; and
 - a coating disposed on at least a portion of the facing sheet, wherein at least a portion of the coating penetrates through at least a portion of the facing sheet and into the gypsum core.
2. The gypsum board of claim 1, wherein the coating penetrates into the gypsum core to a substantially uniform depth across an area of the gypsum board.
3. The gypsum board of claim 1, wherein a thickness of the coating is up to 30 mils.
4. The gypsum board of claim 3, wherein the thickness of the coating is preferably 3-20 mils.
5. The gypsum board of claim 1, wherein the coating is a joint compound.
6. The gypsum board of claim 1, wherein the coating comprises:
 - 25-75 wt. % water;
 - 30-70 wt. % calcium carbonate;
 - 0-30 wt. % filler;
 - 2-10 wt. % latex emulsion; and
 - 0-10 wt. % additives.

-16-

7. The gypsum board of claim 6, wherein the filler comprises one or more of mica, talc, clay, and limestone.

8. The gypsum board of claim 6, wherein the composition further comprises 2-8 wt. % perlite.

9. The gypsum board of claim 6, wherein the composition further comprises a pigment in an amount sufficient to provide a desired tint to the coating.

10. The gypsum board of claim 1, wherein the coating comprises:
10-60 vol. % water;
50-90 vol. % calcined gypsum;
0.1-10 vol. % binder;
0-50 vol. % limestone;
0-10 vol. % clay;
0-30 vol. % other fillers; and
0-10 vol% additives.

11. The gypsum board of claim 10, wherein the other fillers comprise one or more of mica and talc.

12. The gypsum board of claim 10, wherein the composition further comprises 2-15 vol. % perlite.

13. The gypsum board of claim 10, wherein the composition further comprises a pigment in an amount sufficient to provide a desired tint to the coating.

-17-

14. The gypsum board of claim 1, wherein the nail hold of the gypsum board is greater than 80 pounds.

15. The gypsum board of claim 1, wherein the gypsum board further comprises a backing sheet disposed on the second side of the gypsum core.

16. The gypsum board of claim 1, wherein the gypsum board further comprises a backing sheet on a first side and wherein the gypsum core is deposited as a gypsum slurry thereon.

17. A method of producing a coated gypsum board, the method comprising:
depositing a gypsum slurry to form a wet gypsum board having a gypsum core;
applying a coating to the wet gypsum board; and
drying the wet gypsum board,
wherein the step of applying the coating occurs prior to the step of drying.

18. The method of claim 17, wherein the coating is applied directly to the gypsum core.

19. The method of claim 17, wherein the gypsum slurry is deposited onto a facing sheet and wherein the coating is applied to the facing sheet.

20. The method of claim 19, further comprising a step of placing a backing sheet opposite the facing sheet with the gypsum core therebetween.

21. The method of claim 17, wherein the coating is applied during a setting period of the gypsum board.

-18-

22. The method of claim 19, further comprising cutting the gypsum board, wherein the cutting is performed before the coating is applied.

23. The method of claim 17, wherein the coating is applied by a curtain coater, a spray coater, a drip line, or an atomization technique.

24. The method of claim 19, wherein the coating penetrates through at least a portion of the facing sheet and into at least a portion of the gypsum core.

25. The method of claim 19, wherein the coating is a diluted joint compound.

26. A method of making a wall, comprising:
depositing a gypsum slurry to form a wet gypsum board having a gypsum core;
applying a coating to the wet gypsum board;
drying the wet gypsum board, wherein the step of applying the coating occurs prior to the step of drying;
fastening the coated gypsum board to a support structure to form the wall;
and
taping and finishing seams between adjacent coated gypsum boards using a joint compound having a composition substantially similar to the composition of the coating.

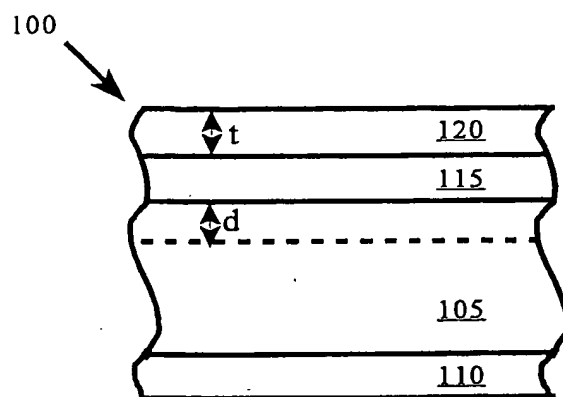


FIGURE 1

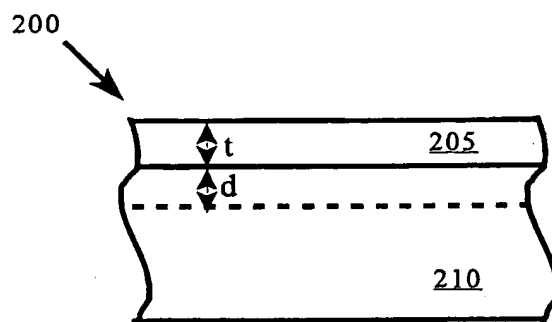


FIGURE 2

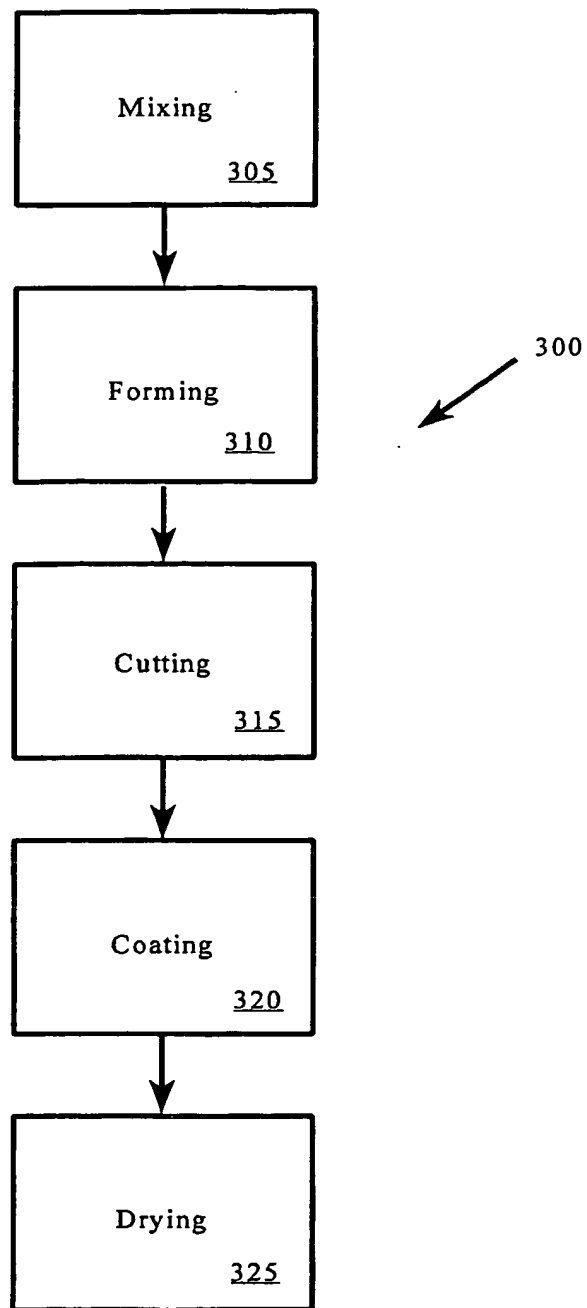


Figure 3

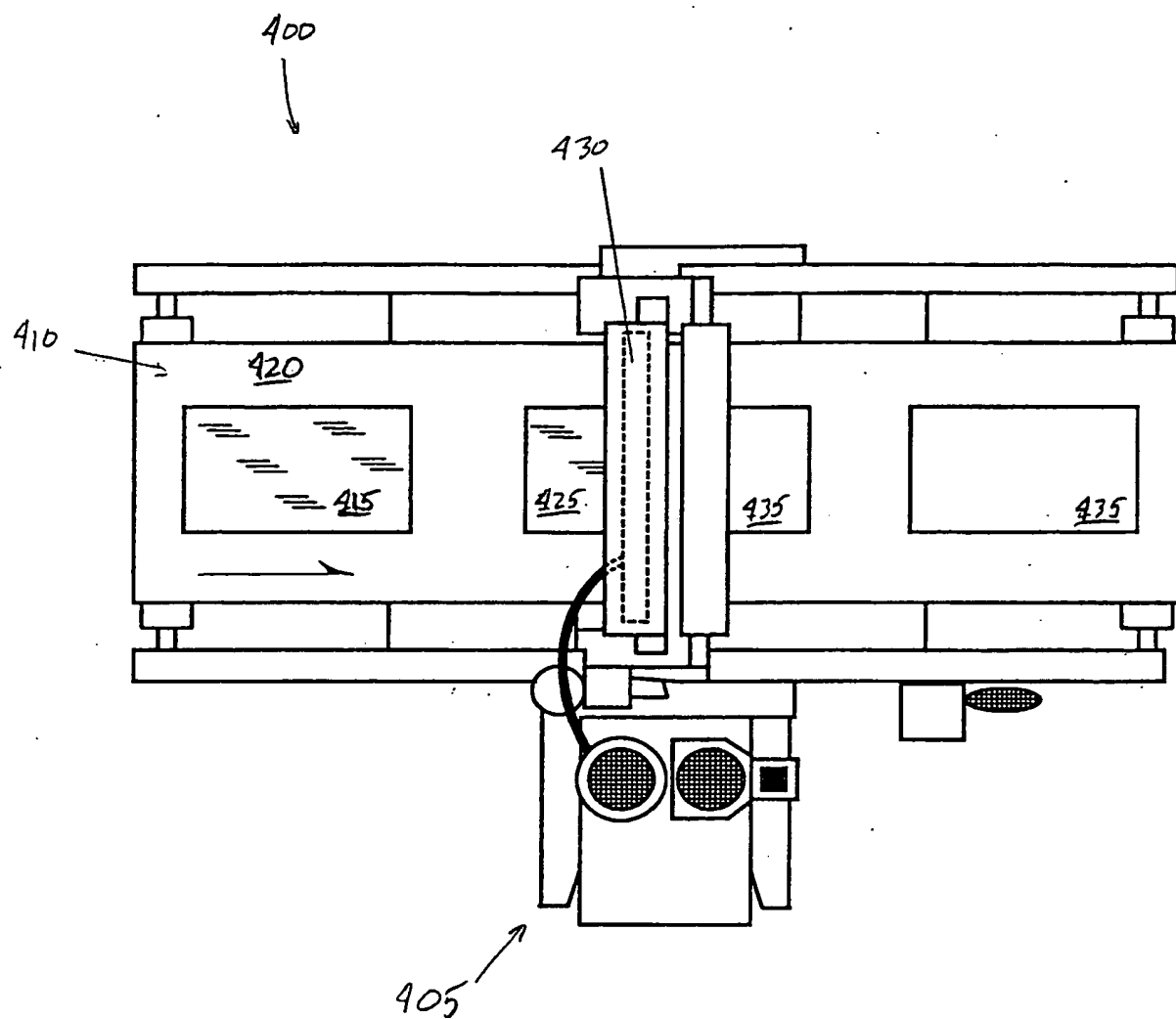


FIGURE 4